

QUALITY OF SWEET CORN KERNEL AS AFFECTED BY PACKAGING MATERIAL AT REFRIGERATED CONDITION

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ABSTRACT

The present study was conducted to determine effects of packaging materials (met pet polypack, polyethylene bag; plastic punnet, HDPE bag, LDPE bag, EPS tray) on quality characteristics of sweet corn kernels under refrigerated storage (4°C and 90% RH) conditions. Quality characteristics were determined by quantitative measurement of physiological weight loss, moisture content percent, total soluble solids, colour, sugar content and hardness of sweet corn kernels. There is decreasing trend in almost all the quantity parameters of sweet corn kernels with increase in storage time. Among all packaging material, LDPE was found to extend the shelf life of sweet corn kernels almost up to 10 days with minimum changes in quality parameters during storage. Met pet polypack was found to be least effective packaging material for sweet corn kernels at refrigerated storage condition.

KEYWORDS: Packaging Material, Refrigerated Storage Condition, Sweet Corn Kernel And Quality Parameters

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INTRODUCTION

Sweet corn also called sugar corn is a variety of maize with high sugar content. Fresh sweet corn (*Zea mays* L.) is a perishable food product prone to fast post harvest deterioration caused by kernel desiccation, loss of sweetness, husk discoloration and development of pathogens. Nutritionally, sweet corn grain contains 60 to 70% starch and 7 to 15% protein. Sugar corn kernels are moderately high in calories as compared to other vegetables. Fresh kernels have been much lower in calories than field corn and other cereals like wheat, rice, etc. Fresh-cut products are fruits or vegetables that have been trimmed, peeled and/or cut into a fully usable product, which is subsequently packaged to offer consumers high nutrition, convenience and flavour while maintaining freshness. Previous work with fresh-cut sweet corn showed that it can be stored for 10 days in low temperature (0-1 °C) (Riad and Brecht, 2001).

The development of packaging suitable for handling of fresh produce necessitates an understanding of the quality characteristics of the produce. Polyethylenes can be easily sealed, has good O₂ and CO₂ permeability, low temperature durability and is of good appearance. Therefore a study was undertaken to study the effect of packaging material on quality parameters of fresh sweet corn kernels during refrigerated storage.

MATERIALS AND METHODS

Experimental Procedure

Freshly harvested sweet corn (*Zea mays*, L.) (Var. local) were procured in the morning hours from local farmer nearby city. Fresh cobs were husked and kernels were removed from sweet corn cob. Clean kernels were

packed in different packaging material and stored under refrigerated condition i.e. 4°C and 90% relative humidity during experiment (Avila *et al.*, 2007).

Quality Parameters

Following quality parameters were noted at regular interval during storage.

Physiological Loss in Weight (PLW): Physiological loss in weight was calculated by considering initial and final weight of the sample on first and observation day respectively and expressed in percentage.

Moisture Content (%): The moisture content was determined by drying at 110° C for 4 h. The percentage moisture content was calculated using the formula (AOAC, 2000).

$$\text{Moisture content (\%)} = \frac{\text{Initial weight} - \text{Final weight after drying}}{\text{Initial weight}} \times 100$$

Total Soluble Solids (⁰Brix): The content of total soluble solids (TSS) in the sweet corn kernel juice was determined with the help of hand refractrometer (0-32⁰Brix).

Sugar Content: Sugar content (%) was analyzed using the phenol-sulfuric method (Riad and Brecht, 2003).

Colour: Using a Hunter Colorimeter on the basis of 3 variables (L*, a*, b*).

Hardness: For measuring the textural quality of sweet corn kernel, the TA-XT plus texture analyzer was used. A standard Kramer shear cell was used for measurement of hardness.

RESULTS AND DISCUSSIONS

Physiological Weight Loss (%)

The results of physiological weight loss of sweet corn kernels (Figure 1) indicated that physiological weight loss of sweet corn kernels in control was increased from 2.93 % (1 day) to 18.80 % (4th day) at refrigerated condition. Whereas sweet corn kernels packed in LDPE (p₅) showed minimum physiological loss in weight from 0.30 % to 16.14 % during storage period of 10 day. Ibrahim *et al.*, (2005) reported that the percentage physiological weight loss directly indicated the loss of moisture from the packed sweet corn. Loss in moisture content is directly related with WVTR of packaging material.

Moisture Content (%)

The effect of packaging materials of sweet corn kernels during storage was depicted through Figure 2. The measured value of moisture content of sweet corn kernels varied from 69.92% to 75.30% during 10 days of storage. The rate of loss in moisture content of the entire sample was varied significantly with packaging material. The moisture content of sweet corn kernels packed in different packaging material at refrigerated condition was found to be decreasing during storage period. Similar trend for loss in moisture content was reported by Shao and Li (2011).

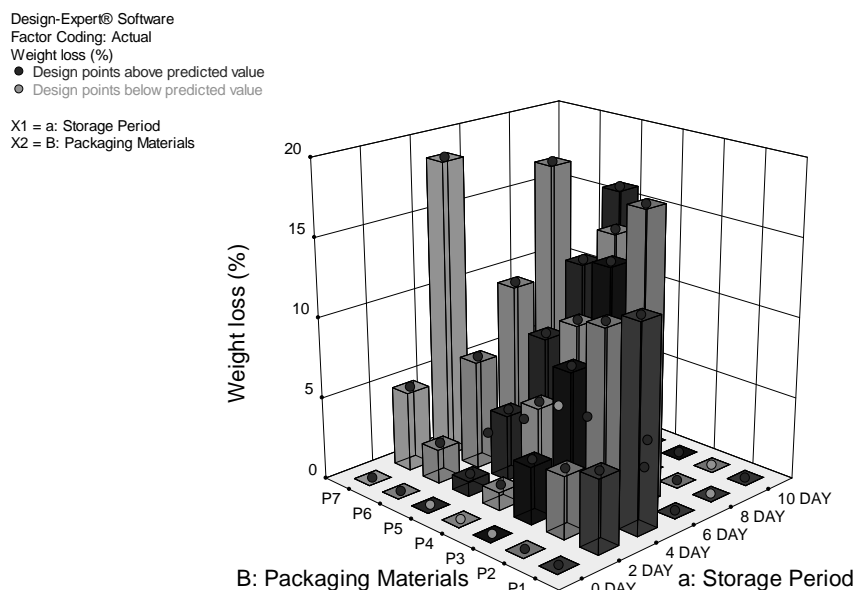


Figure 1: Effect of Packaging Materials on Physiological Weight Loss (%) of Sweet Corn Kernels Stored at Refrigerated Condition

Where, P₁: Met pet Polypack, P₂: Polyethylene Bag, P₃: Plastic Punnets, P₄: HDPE Bag,
P₅: LDPE Bag, P₆: EPS Tray P₇: Without Packaging

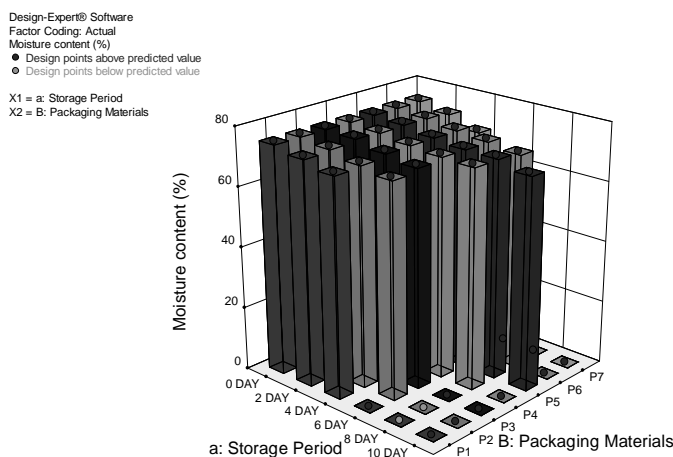


Figure 2: Effect of Packaging Materials on Changes in Moisture Content (%) of Sweet Corn Kernels Stored at Refrigerated Condition

Total Soluble Solids (⁰Brix)

It was observed from Figure 3 that TSS value for sweet corn kernels decreased with increase in storage period. Initial value of TSS of sweet corn kernel was 28.8. TSS of sweet corn kernels decreased from 28.8⁰ Brix to 15.4⁰ Brix during storage period of 10 days for all treatments. The similar trend of decreased in TSS was observed by Avila *et al.*, (2007). The maximum value of TSS was found P₇ i.e. sweet corn kernels without packaging while minimum change in TSS value was found P₅.

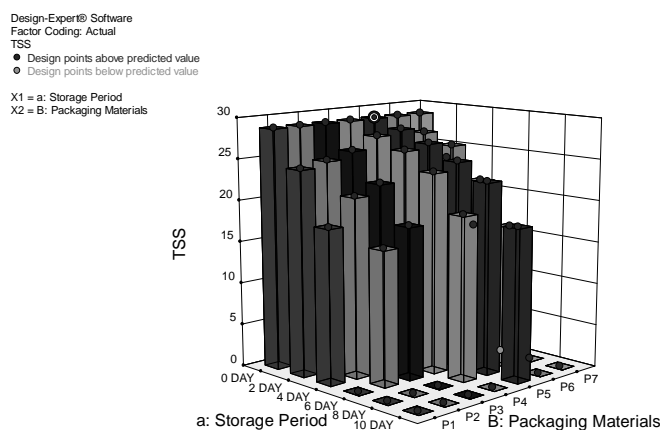


Figure 3: Effect of Packaging Materials on Total Soluble Solids ($^{\circ}$ Brix) of Sweet Corn Kernels Stored at Refrigerated Condition

Sugar Content (%)

The results of sugar content (%) of sweet corn kernels stored in different packaging under refrigerated condition are shown in Figure 4. Minimum loss of sugar was found in treatment P₅ while the maximum loss of sugar was observed in treatment P₇. The reduction of sugar content may be due to the catabolic activities of acid and alkaline invertase and sucrose synthetase vegetable. The formation of sucrose and organic compounds may account for the reduction in sugar level during storage (Karande *et al.*, 2014).

Colour

The results of colour changes in all samples are shown in Figure 5. Sweet corn kernels in treatment P₅ showed least change in L* colour values i.e. 62.33 while the maximum change i.e. 59.08 found in L* colour values found in treatment P₇. From Figure 5 it depicts that the decreasing trend of L* colour values of sweet corn kernels packed in different packaging materials stored at refrigerated condition. LDPE bag was found to be better packaging material for sweet corn kernels as compared to other in respect of least change in colour during the storage. The most common cause is enzymatic browning mediated by the enzyme polyphenol oxidase which adversely affects the change in colour. Film permeability also played an important role in preventing these degradation changes (Ibrahim *et al.*, 2005).

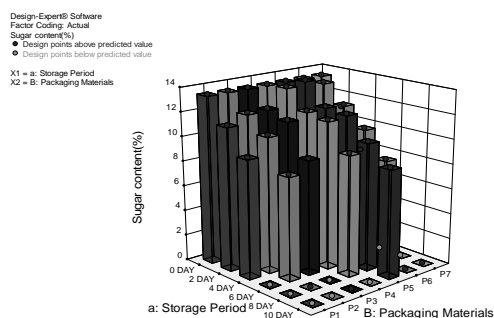


Figure 4: Effect of Packaging Materials on Sugar Content (%) of Sweet Corn Kernels Stored at Refrigerated Condition

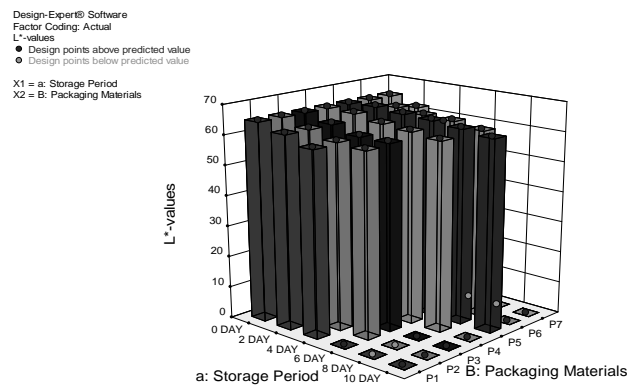


Figure 5: Effect of Packaging Materials on Colour Changes of Sweet Corn Kernels Stored at Refrigerated Condition

Hardness (N)

Figure 6 showed the hardness of fresh sweet corn kernel at initial day of storage was 76.4 N. Maximum hardness value i.e. 165N was found in treatment P₇ while minimum hardness value i.e. 136.6 in treatment P₅. The hardness value of sweet corn kernels packed in different packaging material stored at refrigerated condition increased with increase in storage. Similar result was observed by Martinez *et al.*, (2006). Szymanek (2009) reported that there was increased in hardness with respect to decreased in moisture content.

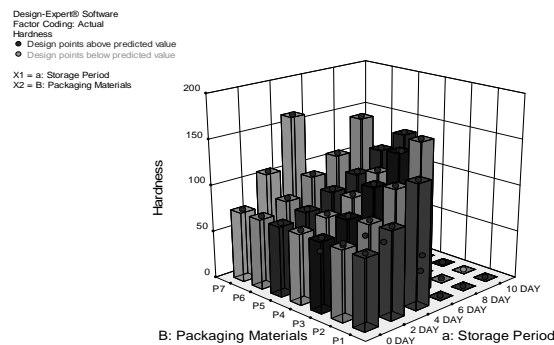


Figure 6: Effect of Packaging Materials on Hardness (N) of Sweet Corn Kernels Stored at Refrigerated Condition

CONCLUSIONS

- Quality characteristics such as weight loss (%), moisture content (%), total soluble solids (⁰Brix), colour, sugar content, and hardness were found better in sweet corn kernels packed in LDPE bag followed by HDPE bag.
- LDPE packaging material showed better storability of 10 days for sweet corn kernels corn under refrigerated conditions.

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